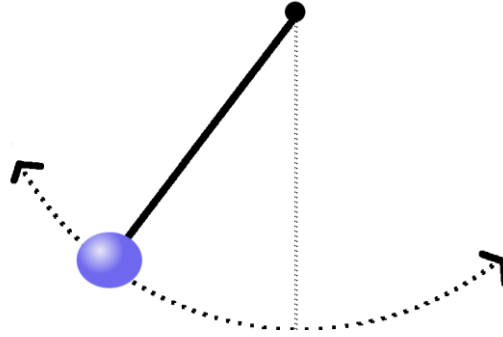


MM1A3. Students will solve simple equations. b. Solve equations involving radicals such as, $\sqrt{x + b} = c$ using algebraic techniques.

Pendulum Learning Task

In this task, you will explore the physics of pendulums.



Your pendulum will be made from string tied to a simple weight on one end and to a fixed point on the other end.

A pendulum's period (T) is a function of the length of string leading to the weight (L). The equation is below. Note: 384 is the acceleration due to gravity in inches/second², π is 3.14, and T is the number of seconds it takes your pendulum to complete a full swing.

$$T = 2\pi \sqrt{\frac{L}{384}}$$

1. Study the pendulum function and the diagram above it.
 - a. What is the period of a pendulum with a 4 inch long string? A 16 inch long string?
 - b. What length string is required for a pendulum to have an 8 second period?
 - c. The irrational number π is usually associated with circles. Why do you think it appears in the pendulum function?

2. Graph the pendulum function $T(L)$. What domain and range make sense in this project?
3. Verify that the pendulum function $T(L)$ by building a pendulum. Make a table of values for L (length of string) and T (period). Describe how your experimental values compare to those predicted by the function, $T(L)$.
4. Radical functions require algebraic skills that include finding common denominators. Solve these problems to become an algebraic ninja.
 - a. $5 + \sqrt{x - 10} = 30$
 - b. $\sqrt{x + 20} - x = 0$
 - c. $x + 2 = \sqrt{7x + 2}$
 - d. $\sqrt{\frac{x+2}{4}} - 8 = 0$
5. You want to decrease a pendulum's period from 5 seconds to 4 seconds. Should you shorten the string or make it longer? Why? (refer to the function, $T(L)$, in your explanation)

Challenge: Build a Pendulum of Period T

Time to put your skills with pendulums to the test! I want you to build a pendulum with a specific period.

You have the following materials:

String, 10 feet long Weights of several masses & sizes Scissors Stopwatch
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Period (T) value 1: _____

Theoretical length (L) of string: *with work shown*

Experimental value:

Explanation for any difference:

Period (T) value 2: _____

Theoretical length (L) of string: *with work shown*

Experimental value:

Explanation for any difference:







Rubric

Turn this rubric in with your final project.

Student name: _____ Period: _____

Project format:

- ☐ Poster
- ☐ PowerPoint
- ☐ Movie
- ☐ Essay
- ☐ Free choice: _____

Project Element	Outstanding projects will...	Grading
Study the function $T(L)$	analyze the function and diagram to explain the connection to π , a constant usually associated with circles. (Question #1)	10%
	 <p>Level of mastery:</p>	
Graph $T(L)$	graph the pendulum function, $T(L)$ with the correct domain and range represented. (Question #2)	10%
	 <p>Level of mastery:</p>	
Verify $T(L)$	verify the theoretical results from $T(L)$ by building a pendulum, measuring its period, and comparing to $T(L)$. Results of the experiment are presented and discussed. Sources of error are explored. (Questions #3 & 5)	30%
	 <p>Level of mastery:</p>	
Practice solving radical equations	correctly solve practice problems given in the project document. (Question #4)	10%
	 <p>Level of mastery:</p>	
Build a pendulum of period T	build a pendulum with a period as given by the teacher. (Challenge problem)	30%
	 <p>Level of mastery:</p>	
Examine differences between theoretical & experimental results	explore reasons why the theoretical value for period of a pendulum and the experimentally measured value may differ. Reasons are plausible & significant. (Challenge problem)	10%
	 <p>Level of mastery:</p>	